



HYMENOPTERAN DIVERSITY OF CHANDERTAL WILDLIFE SANCTUARY IN HIMACHAL PRADESH, INDIA

Ranjit Singh¹ | D.R. Thakur²

¹Assistant Professor, Department of Bio-sciences, M.L.S.M. College Sunder Nagar, District Mandi, H. P. India.

²Prof. & Head, Department of Bio-sciences, H. P. University Summer Hill, Shimla. India.

ABSTRACT

The Chandertal Wildlife Sanctuary occupy high altitude wetland area designated as an internationally known Ramsar site situated near little below the Kunzam Pass (4520 m above mean sea level) in Lahaul & Spiti district of Himachal Pradesh. Chandertal Lake alongwith few semi permanent land locked water reservoirs interspersed among grassy meadows help in wetland formation. The hymenopterans exhibit instinctive behaviour with perfection along with ecological, medicinal and economic significance. Various sites of Chandertal Wildlife Sanctuary were explored for collection and observations of its inhabitant nival fauna. The air density, atmospheric pressure, concentration of oxygen, carbon dioxide and water vapours are quite low. Due to high altitude along with high atmospheric transparency the insolation of high intensity during morning to noon make area warmer but rapid radiation loss during evening and night hours along with high wind velocity result in to excessive cold nights. Many such other factors make this area intolerable so that very less biodiversity is present. From this studied area, during July to October months of the survey years, seven hymenopteran species belonging to seven genera of four families have been collected and described. *Bombus rufofasciatus* Smith, *Sphecodes iridipennis* Smith, *Megachile Latrielle* of family Apidae; *Larra Fabricius*, *Podalonia* Fernald of family Sphecidae; *Formica gagates* Latreille of family Formicidae and one species of family Ichneumonidae are reported. The colonies of *Formica gagates* found to be most abundant in grassy vegetation and underneath stone crevices. Among aerial hymenopterans, *Sphecodes iridipennis* being small in size were second most abundant and collected via sweeping the grassy vegetations. The relative abundance of other described hymenopterans found to be comparatively less.

KEY WORDS: Chandertal, diversity, apidae, sphecidae, formicidae, ichneumonidae.

Introduction:

The Chandertal Wildlife Sanctuary is a Ramsar site and high altitude Wetland situated near little below the Kunzam Pass (4520 m amsl). It is situated at 32° 29' N latitude and 77° 36'E longitude with altitude upto 4830 m above mean sea level falling in the 1 B Tibetan Plateau of Biogeographic zone. The 35% area of sanctuary is covered by alpine herbs and grasses (*Poa*, *Anaphalis*, *Gentiana*, *Pedicularis*, *Potentilla*, *Polygonum*, *Ranunculus*, *Thymus* etc.). With the onset of spring (mid april-may), the insect communities after winter diapause become active. Summer lasts till September with hot days and extremely cold nights. This zone is in rain shadows areas of Himalayas so receive minor rainfall as misty drizzle but receives heavy snow fall (75 cm) and mercury dip down resulting in freezing of Chandertal lake during winter. Meagre work found on hymenopteran diversity from the Chandertal Wildlife Sanctuary, therefore this research work was conducted to fulfill the taxonomic gap of this area.

About 1,20,000 species have been described throughout the world. Of these, about 20,000 species belong to superfamily Apoidea while about 60,000 species to parasitic family Ichneumonidae. India holds about 8.3 % of total world's hymenoptera accounts about 10,000 species (Jonathan, 1998). Gillot (2005) estimated 1,30,000 hymenopteran species in the world. About 60 percent of Indian hymenopterans are distributed in Himalayan region which shows affinities with the taxa of Palaearctic region (Jonathan, 1998). From Nanda Devi Biosphere Reserve, Gupta (1997) gave detailed systematic account of 24 species of Hymenoptera. An account of 25 species belonging to six families were recorded from Gobind Pashu Vihar, Uttarakhand. In which *Odontomachus punctulatus* Forel (Formicidae) and *Odynerus sikkimiensis* Bingham (Eumenidae) were new distributional records from Western Himalaya (Gupta, 2004). From Pin Valley National Park in Lahaul & Spiti district of Himachal Pradesh, Gupta (2008) described seven species belonging to families Vespidae (4 spp.) and Sphecidae (3 spp.). Of these seven, three species of Sphecidae (*Bembix latitarsus* and two of genera *Podalonia*) were new records from Himachal Pradesh. Species belonging to *Podalonia* were common in Lahaul & Spiti district and found ectoparasitoids of lepidopteran larvae.

The research work from Chandertal Wildlife Sanctuary revealed the representation of both major division of Hymenoptera viz. Aculeata by species of Apidae (3 spp.), Sphecidae (2 spp.) and Formicidae (1 sp.) while Parasitica represented by single species of Ichneumonidae.

MATERIALS AND METHODS:

The specimens of *Formica gagates* were collected with the help of forceps while other flying hymenopterans were collected by using sweeping and aerial netting methods. Nylon net bags of 75 cm length and mouth diameter 38 cm on metal ring were used. Sturdy but light weight handle of varying size was attached to metal ring. After collecting the hymenopterans, their killing was necessary to avoid damage to their taxonomic characters during their struggle to fly away and was done by using killing bottles. Glass jars with wide mouth and tight lid sup-

plied with a layer of Na or K cyanide covered with plaster of paris (POP) were used. Other liquid chemicals like chloroform, ethyl acetate and ether were also used. Liquid chemicals poured over cotton, placed in air tight jar and covered by 3-4 layers of filter paper so that insect specimens may remain dry, were used. A killing bottle with a layer of saw dust soaked with few drops of ethyl acetate gave good results and specimens also remains fresh and flexible for stretching as suggested by Ghose (1990), were used. Insect specimens could not be kept in killing bottle for long time as identifying features may be damaged. So after killing, each specimen was transferred to individual butter paper packets (with code) for temporary storage and transported to laboratory. Field note book was used for writing butter paper code and details regarding date, place of collection, habitat, colour of live specimen, host plant and other necessary informations. In the laboratory, specimens were relaxed in relaxing jar for pinning and stretching. Relaxing jar/box made of transparent glass/aluminium containing layer of cellulose wadding at its bottom. The crystals of thymol for protection of specimen from fungal infection in relaxing box. Soft wooden setting board whose groove size may be adjusted between 4 to 15 mm. Grease proof paper strips of variable length and breadth depending upon wingspan etc. were used as setting strips. Relaxed hymenopterans were properly stretched and pinned by using rust free entomological pins of different size depending upon the size of specimen as suggested by Arora (1990) Small sized hymenopteran viz. black ants were mounted on small triangular cards with water soluble adhesive, a method suggested by Jonathan (1990). Nikon D-80 Camera with zoom tele-lenses, 10 x 50 super Zenith field binocular and 1000 mm tele-lens of Questar make were used for photography. The collected specimen were identified morphologically and compared with earlier records of High Altitude Zoological Fields Station, Zoological Survey of India, Solan and Department of Zoology, Punjabi University, Patiala. These identifications were later on confirmed by specific group taxonomists of North Region Zoological Survey of India, Dehradun, Uttarakhand and Zoological Survey of India, Kolkata. The collected specimens were deposited in laboratory of department of bio-sciences of Himachal Pradesh University at Shimla.

RESULTS:

The collection tours in such a high altitude study area were possible only during July to October months of each year since in remaining months, this area remain mostly snow covered and become inaccessible via land transport. This research work revealed the presence of seven species of Hymenoptera belonging to seven genera of four families. *Bombus rufofasciatus* Smith, *Sphecodes iridipennis* Smith, *Megachile Latrielle* (Apidae); *Larra Fabricius*, *Podalonia* Fernald (Sphecidae); *Formica gagates* Latreille (Formicidae) and one species of family Ichneumonidae. The species belonging to *Megachile Latrielle* of Apidae and two of Sphecidae are identified upto generic level while Ichneumonid is identified upto family level only (under study).

Family: ApidaeGenus: *Bombus*Species: *rufofasciatus* Smith1852. *Bombus rufofasciatus* Smith, Trans. Ent. Soc. ii:48.**Locality:** Near Chandertal Lake.**Material examined:** Himachal Pradesh: Lahaul & Spiti district: grassy meadows of sanctuary, 2 ♀, 14.vii.2007, 1 ♀, 2 ♂, 30.vii.2008, 3 ♀, 10.viii.2009, Ranjit.**Description:** Head elongate, with long pubescence on front, between antennae and clypeus; the clypeus, vertex and cheeks closely punctured; thorax and abdomen densely pubescent except apical segment. Head, pronotum, posterior mesonotum, scutellum, sides of thorax, coxal region of legs and second abdominal segment possess long black hair. A band on anterior mesonotum, the median segment, the basal and fourth to sixth abdominal segments with grayish white, and the third segment with bright fulvus-red pubescence; the pubescence short and pale golden on tibiae and tarsi. Wings hyaline, lightly fuscous towards apical margins.**Distribution:** Northern India, Sikkim, Himachal Pradesh.**Family: Apidae**Genus: *Sphecodes*Species: *iridipennis* Smith1852. *Sphecodes iridipennis* Smith, New Sp. Hym. B.M., p. 27, ♀; Dall. Torr. Cat., x: 7.**Locality:** Flowering meadow about 10 km. from Batal towards Chandertal lake. **Material examined:** 3 ♀, 10.vii.2007, 2 ♀, 3 ♂, 30.vii.2008, 3 ♀, 14.viii.2009, Ranjit.**Description:** Body length varies between 5-6 mm. Antennae and legs are piceous. Head, thorax and abdomen are smooth, polished and shining. Black head and thorax finely punctured but not so closely. Clypeus convex and transverse anteriorly. Abdomen ferruginous, base and apex of 2nd and base of 3rd segment above fuscous, apex of 3rd and following segments are black. Hyaline wings with specific iridescence.**Distribution:** North India, Himachal Pradesh.**Family: Apidae**Genus: *Megachile* Latrielle1802. *Megachile* Latrielle, Hist. Nat. Ins., iii: 382.**Locality:** Flowering meadow about 10 km. from Batal towards Chandertal lake. **Material examined:** 2 ♀, 8.vi.2006. Banyal, Thakur and Ranjit; 2 ♀, 15.vii.2007, 2 ♂, 31.vii.2008, 3 ♀, 10.viii.2009, Ranjit.**Description:** Scutellum not armed. Abdomen convex above but neither cylindrical nor curved. Fore wings with two cubital cells. Second recurrent nervure reaches within apex of second cubital cell. These are commonly known as leaf cutter bees since leaf pieces used in nest making.**Distribution:** Nearly cosmopolitan.**Family: Sphecidae**Genus: *Podalonia* Fernald**Locality:** Outlet of Chandertal lake.**Material examined:** Himachal Pradesh: Lahaul & Spiti district: grassy meadows of sanctuary, 3 ♀, 7.vi.2006. Banyal, Thakur and Ranjit; 2 ♀, 15.vii.2007, 2 ♂, 31.vii.2008, 3 ♀, 10.viii.2009, Ranjit.**Description:** Black coloured body but 1st, 2nd and 3rd abdominal segments are red. The vestiture of head and thorax are black. The propodeal dorsum is obliquely striated.

Family: Sphecidae
Genus: *Larra* Fabricius



1796. *Larra* Latreille, *Precis Caract. Gen. Ins.*, p. 116.

1807. *Liris* Illig., *Edit. Faun. Etrusc.*, ii : 101.

1884. *Larra* Kohl, *Verh. Zool.-Bot. Ges. Wein.*, p. 65.

Locality: Grassy ground away from northern vicinity of Chandertal lake.
Material examined: Himachal Pradesh: Lahaul & Spiti district: grassy meadows of sanctuary, 2 ♂, 3.vi.2006, Banyal, Thakur and Ranjit; 2 ♀, 15.vii.2007, 2 ♂, 28.vii.2008, 3 ♀, 15.viii.2009, Ranjit.

Description: Upper inner angle of eye is bordered by a deep sulcus. Frons and vertex are shining. Pronotum posteriorly on a level with mesonotum. Body black except first to third abdominal segments which are reddish. Vestiture are silvery. Wings are clear hyaline. Dorsal propodium finely and densely punctured.

Distribution: Mostly in tropical but also reported from nearctic and palaearctic regions.

Family: Formicidae
Genus: *Formica*
Species: *gagates* Latreille



1798. *Formica gagates* Latreille, *Ess. Hist. Fourm.*, France, p. 36.

1894. *Formica gagates* Forel, *Jour. Bomb. Nat. Hist. Soc.*, viii: 402.

Locality: Western side of the lake.

Material examined: Himachal Pradesh: Lahaul & Spiti district: grassy meadows around Chandertal, 3 ♀, 10.vi.2006. Banyal, Thakur and Ranjit; 2 ♀, 15.vii.2007, 2 ♂, 29.vii.2008, 3 ♀, 12.viii.2009, Ranjit.

Description: Body dark castaneous, smooth and shining with scattered erect hair on frontal head and on posterior half of abdomen. Pedicel node convex in front but flat posteriorly, its upper margin rounded, remarkably attenuate and sharp. Abdomen narrower posteriorly, less depressed and convex shaped. Anal opening circular (Fig.18).

Distribution: North America, Northern and central Europe, Northern Asia, Frontier of Tibet, H.P. (Lahaul & Spiti).

Family: Ichneumonidae



Locality: Grassy pastures of northern vicinity of lake

Description: Comparatively longer antennae with more than 16 antennal segment. The trochanter is two segmented front wing lacks costal cell. Permanently extruded ovipositor is comparatively longer.

DISCUSSION:

Many collecting tours during July to October months of different survey years unveiled presence of seven hymenopteran species belonging to seven genera of four families. Although four species are yet to be described up to species level. The openings of colonies of *Formica gagates* found underneath the medium sized stones and through crevices these came out in grassy meadows for foraging. At elevation more than 4000 meters, there is dominance of understone communities (Mani, 1962). Tak and Rathore (2008) described 7 ant species including 2 species of *Formica* genera from Pin Valley National Park. From same locality, Gupta (2008) described 7 aculeate species including *Podalonia* sp. I and sp. II with their superficial resemblance and few differences with *Podalonia hirticeps* and *P. laeta* respectively. *Bombus rufofasciatus* Smith, *Sphecodes iridipennis* Smith, *Megachile* Latreille of family Apidae were found foraging the flowering species of sub alpine pastures. From Lahaul & Spiti valley, Saini and Ghattor (2007) gave detailed taxonomic studies of 7 species of bumble bee including *Bombus rufofasciatus* along with their host plants and distributional ranges. *Larra* Fabricius and *Podalonia* Fernald were found near lepidopteran larvae. Gupta (1995) have reported 2 species of *Podalonia* Fernald and one of *Larra* Fabricius from Western Himalaya. The specimens of ichneumonid studied area could be confirmed only up to family level. Jonathan (2005) reported 319 species (26% of Indian Ichneumonids) from Himachal Pradesh but only 7 species represent Lahaul & Spiti district. The endemism is significant in North-West Himalaya and of the total about 270 Palaearctic species known from nival zone, about 60% species are endemic to it. The endemism among Palaearctic species of Trichoptera is 100 %, Orthoptera 83%, **Hymenoptera 52%**, Coleoptera 61% and Lepidoptera 45% (Mani, 1962). The Hymenopteran diversity recorded from high altitude cold desert Chandertal Wildlife Sanctuary is comparatively less but is in accordance with Kikkawa and Williams (1971) who explained that diversity decreases with increasing altitude. Longer winter season with heavy snowfall and shorter spring, rainy and summer season along with topography/geography of area are some key factors which limit the biodiversity richness.

CONCLUSION:

The Chandertal Wildlife Sanctuary occupying high altitude wetland area is also a Ramsar site possessing unique flora and fauna which needs to be explored in detail. This research work revealed the presence of seven species of

Hymenoptera belonging to seven genera of four families. *Bombus rufofasciatus* Smith, *Sphecodes iridipennis* Smith, *Megachile Latrielle* (Apidae); *Larra* Fabricius, *Podalonia* Fernald (Sphecidae); *Formica gagates* Latreille (Formicidae) and one species of family Ichneumonidae have been reported.

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